

## The Dow Chemical Company

### Background

The Dow Chemical Company develops and manufactures a portfolio of chemical, plastic, and agricultural products and services in 170 countries around the world. With annual sales more than \$18 billion, Dow conducts operations through 14 global businesses employing 40,000 people. The company has 123 manufacturing sites in 32 countries and supplies more than 3,500 products.

Dow initiated an ambitious “Power Conversion Project” in the mid 1980’s because of the higher efficiencies and environmental benefits that could be achieved through cogeneration. The Freeport Texas Operations (one of the world’s largest chemical complexes) is Dow’s largest manufacturing operation in terms of pounds of product manufactured. The energy intensive research and production processes of the site made cogeneration an ideal choice. The Freeport complex manufactures plastics, epoxies, and hydrocarbons among many other products.

### Project Description

The Dow Chemical Company maintains four cogeneration plants to meet the expanding power and steam demands at the Freeport Texas Operations complex. These plants (primarily fired by natural gas) include twelve combustion turbines with heat recovery steam generators ranging in size from 65 MW to 100 MW. This system is supplemented by three 500,000-lbs/hr boilers with back pressure steam turbines.

<b>Dow’s Freeport Texas Operations Cogeneration Plant Operating Data for 1999*</b>	
Project Design Capacity (MW <sub>e</sub> )	1,600
Power to Heat Ratio	0.8
Total Net Efficiency (HHV)	74%
% Fuel Savings <sup>1</sup>	14% (230,000 metric tons carbon)
Effective Electric Efficiency (HHV) <sup>2</sup>	67%
% NO <sub>x</sub> Decrease <sup>3</sup>	57% (12,000 tons)

*\*Data based on 8,760 annual hours of operation*

<sup>1</sup> Savings based on 50% efficient electric and 80% efficient thermal generation with natural gas as the primary fuel.

<sup>2</sup> Effective Electric Efficiency = (CHP power output)/(Total energy input to CHP system – total heat recovered/0.8). Assumes thermal output provided at 80% efficiency.

<sup>3</sup> Compared to electric emissions of 3.6 lb NO<sub>x</sub>/MWh (1998 national average) and boiler emissions of 0.1 lb NO<sub>x</sub>/MMBtu.

## Success Strategy

Dow has a corporate goal to improve energy efficiency by 20% from 1994 to 2005. This is in addition to the 20% improvement accomplished from 1990 to 1994. With this type of high-level support for energy efficiency, funds and personnel are available for cost-effective projects to reduce energy intensity. Dow's cogeneration project in Freeport, Texas is a financial success, providing significant power and steam costs savings. The complex uses approximately 87% of the electricity generated and sells the remainder to the grid.

## Benefits

The project also produces considerable emissions benefits by reducing emissions of NO<sub>x</sub>, SO<sub>x</sub>, and CO<sub>2</sub>. The annual NO<sub>x</sub> reduction from the facility is equivalent to the annual emissions from 610,000 vehicles. The project benefits the climate since it uses 14% less fuel than separate heat and power, conserving 16 billion standard cubic feet of natural gas a year, and annually releases 930,000 fewer tons of CO<sub>2</sub>. This is the equivalent of planting 250,000 acres of forest or displacing the annual greenhouse gas emissions from 84,000 households.

In March 2000, the United States Environmental Protection Agency and the Department of Energy recognized the pollution prevention benefits of this CHP facility with an ENERGY STAR® CHP Award. For more information on ENERGY STAR® CHP awards, please click [here](#).